Mammography Quality:

The Critical Role of Standardized Positioning

Louise C. Miller, RTRM
Director of Education
Mammography Educators, LLC
San Diego, CA

MAMMOGRAPHY EDUCATORS

Poor Positioning Responsible For Most Clinical Image Deficiencies, Failures

Mammography combines "the science of imaging and the art of positioning" [1]. Although there have been many significant and exciting changes to the technology of mammography since the passage of MQSA in 1999, including the introduction of full-field digital mammography (FFDM) and digital breast tomosynthesis (DBT), one aspect of mammography that remains unchanged and critically important is proper patient positioning.

A Technologist's Perspective of the FDA Report "Poor Positioning Responsible for Most Clinical Image Deficiencies, Failures"

By Louise Miller, RT(R)(M)

Recently I received a call from a radiologist asking me to provide 8 hours of positioning training for his technologists. They had failed American College of Radiology (ACR) accreditation for positioning and needed to document the training in order to resubmit new images, which were due in a week. A side note here: if you fail, get help EARLY. When I met the radiologist

Repeats, Rejects and Recalls: How Many is Too Many?

By Louise C. Miller, ARRT, CRT, RTRM

Recently, I was asked to work in a breast imaging facility and conduct an on-site p workshop. The radiologist said that the facility had a high level of "TCBs," and he w the increased, unnecessary additional radiation dose to the patients. I was emba never heard that acronym used and was not sure what it stood for. It meant: Technical Ahh…no wonder…we rarely have TCBs. I spent a week at the facility. A year later, he said that they had reduced TCBs by 50%! Unfortunately, the data were not published.

Technology Changes: Positioning Challenges

By Louise C. Miller, RTRM

Mammographers have seen many changes in mammographic technology and equipment over the course of their careers. Yet many of us have not been given the skills and tools needed to make the transition smoothly. As things evolved, we did our best to adapt with very few resources available. Most manuals and videos for positioning techniques were created for film-screen equipment. Even with mandated initial and continuing education requirements, most of us were not taught consistent, reproducible and ergonomically sound positioning methods. Variations in styles were passed from one generation of mammographers to the next. As technology changed and improved, most of us were not aware that our positioning techniques needed to change and improve also.

If, like me, you remember Xerography, you are most likely ready for retirement. Younger mammographers have no understanding of table-top imaging, blue toner, charged plates, compression balloons, curved paddles or sponges. We learned to position by the "see one, do one, teach one" method. We figured it out. Then it was on to film-screen equipment. No more sponges, no more ribs…and what about the skin line? The pectoralis muscle suddenly became a major focal point and compression changed dramatically: straight paddles instead of curved paddles, "rigid" compression instead of soft sponges. Clinical image evaluation standards were set. There were seminars and application specialists to help us make the transition…barely.

Just when we were getting comfortable, digital imaging arrived. Most of us have direct experience with that transition, perhaps the most significant change that mammographers have experienced. Now technologists of all ages are wrestling with the transition from digital mammography to tomosynthesis. While each new modality requires eight hours of specialized training, most often offered and obtained from the equipment manufacturer, none includes specific positioning training or hands-on experience with actual patients. So we are left to try to figure it out…again…and most of us struggle a bit at first. In retrospect, we ask ourselves: If the technology and equipment change, do the positions change? Will our images change? A new way of "looking at things" is essential to answer those questions. The real question is: why would it not change?

Equipment Changes

The biggest positioning challenges are related to the increased length and thickness of the image receptor (IR). The increased width of the face shield can prove to be an additional problem. These differences can frequently be a challenge for the technologist when transitioning to each new modality. How can the technologist compensate for this and how can this affect our clinical images? A complete understanding of the equipment differences, proper positioning and patient anatomy is essential.

Image Receptor

Standards for film-screen units in the United States are based on two sizes of imaging platforms: 18 x 24 cm and 24 x 30 cm. As digital technology was developed, the 18 x 24 detector was initially adopted. However, according to demographics at that time, up to 30% of patients could not be accommodated on the smaller platform, resulting in sub-optimal "tiling" or "mosaic" image acquisition. Both manufacturers of digital equipment in the United States (General Electric and Hologic) then chose a larger option of 24 x 29-31 cm with various sized compression paddles. While the interchangeable and movable paddles were helpful for positioning, the increased size of the image receptor often pushed back against the patients and mammographers. The next generation of

The Member Newsletter of the Society of Breast Imaging
Click on this bar to return to Table of Contents

Technology Changes: Positioning Challenges, continued from previous page

tomosynthesis and tomosynthesis upgradeable units arrived with an increase in length of the IR once again. Within most of our careers, we have experienced an increased length in Bucky/IR of up to 49% and an increased thickness of the Bucky/IR of up to 80%.

Face Shield

While face shield measurements remained fairly consistent from film-screen to digital imaging, modifications were made for tomosynthesis units to accommodate the tube movement. This required an increased width of the shield up to 50% when compared to non-tomosynthesis units.

Possible, And Often Correctable, Changes In Clinical Images

1. Inadequate length of the pectoralis muscle on the mediolateral oblique (MLO) view, optimally visualized down to the posterior nipple line (PNL), and/or inadequate imaging of the inframammary fold (IMF): The increased length of the IR requires an adjustment of the patient. Patient positioning and selection of the proper degree of angulation are also essential.
2. Inadequate width of the muscle at the axilla on the MLO view: Due to the increased width of the IR, the technologist should ensure that the corner of the IR is placed properly in the axilla.
3. Inadequate visualization of the deep medial breast tissue on the craniocaudal (CC) view: The increased width of the face shield may prohibit the patient's head from coming forward and around the shield and could lead to the exclusion of medial breast tissue and poor visualization of the cleavage area. Careful attention must be given to positioning techniques in order to avoid this potential error.
4. Visualization of the latissimus dorsi muscle, many times identified as the pectoralis minor muscle on the MLO view: Some patients' axillae are too "narrow" to accommodate the increased thickness of the IR. It therefore may be necessary to place the IR behind the latissimus dorsi muscle.
5. Increase in skin and fat folds: Skin and fat folds, while often "burned out" on film-screen images, are enhanced with digital imaging. This is due to differences in imaging techniques. Attenuation of the beam, caused when the digital algorithm is applied to the thicker skin, is most common in the posterior breast and nipple area on the CC view, and in the IMF and the axilla on the MLO view. While proper positioning can reduce the presence of skin and fat folds, these folds cannot be entirely eliminated. Breast tissue should never be sacrificed to exclude a fold. An additional image should only be taken if the skin or fat folds impede adequate visualization of the breast tissue. Fortunately, tomosynthesis eliminates this need altogether.
6. Motion artifact: Many facilities have seen an increase in call backs due to motion artifact. Unfortunately, technologists cannot see the motion on their workstations, so motion may go undetected until seen by the radiologist and a call back may be required. Many times having the patient stop breathing during the exposure can be helpful.

While there are no current data published on the above observations, my experience is that the evolution in technology has also produced some changes in our clinical images. Ideally, each technologist and each radiologist must be aware of the differences and do their best to adjust to the technological changes so that we can produce optimal image quality for our patients. However, even while taking these factors into consideration, technically 'perfect' images are very difficult to obtain. Further studies should be conducted to quantify reasonable expectations based on the numerous variables that mammographers face. ❖

Now is the time to make a collaborative effort to establish, improve and maintain quality

QUALITY

Most all industries have established standardized methods performance of tasks to

*Establish and maintain quality
*Reduce errors
*Increase productivity
*Increase consumer satisfaction
*Increase profit
*Reduce possibility of litigation

In General Radiology technologists are taught

- To perform all exams using standardized techniques
- Perform all exams in the same sequence
- That all training is competency based and their skills will be evaluated for positioning techniques as well as clinical image evaluation.

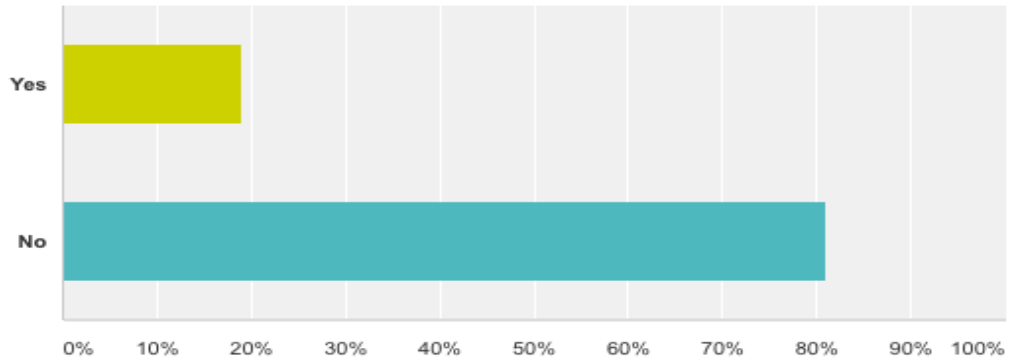
But NOT mammography

Most technologists *do not* practice a standardized method of positioning

Q5

Do you think that each mammography technologist at your facility positions patients the same way?

Answered: 100 Skipped: 0



Answer Choices	Responses	
Yes	**19.00%**	19
No	**81.00%**	81
Total		100

Results

- Most technologists know *what* they need to see on the images but have not been taught *how* to correct positioning problems.
- Most technologists have not been taught a standardized method of positioning
- Most technologists have not be trained by a qualified trainer.

How did this happen?

- No standardization for positioning
- CEUs for hands-on positioning not required
- Initial 25 mammograms required but under who's supervision?

How did this happen?

- Technologists are getting most CEUs online (no actual education for positioning)
- Radiologists are passing inadequate images and/or can only give feedback regarding positioning criteria

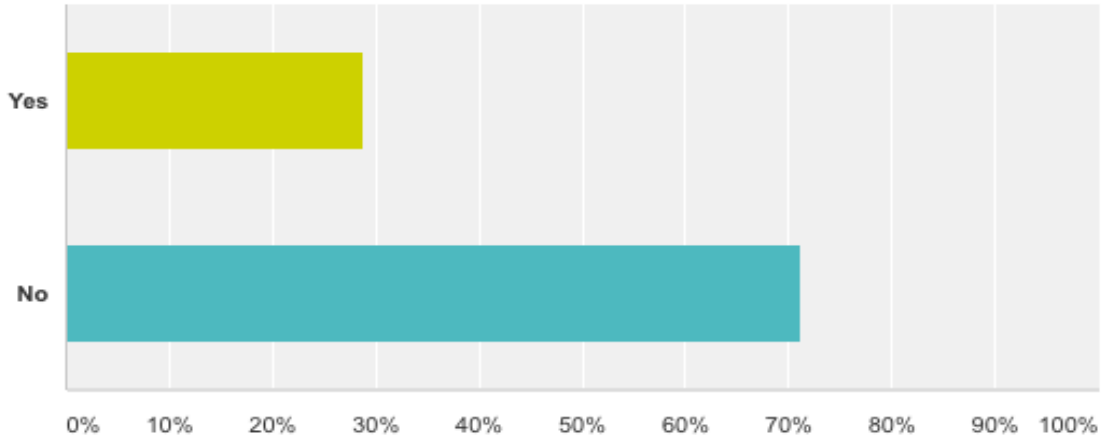
How did this happen?

- Updated positioning trainings are not provided by employers (until they are sited by the ACR.
- There is no current published data available to establish parameters for positioning.
- Outdated materials with no updates for positioning with FFDM or DBT (whose equipment design require a modification of positioning techniques used for FS)

Q10

Do you find the 1999 ACR Quality manual be a useful, current, and relevant source for positioning information?

Answered: 97 Skipped: 3



Answer Choices	Responses	
Yes	**28.87%**	28
No	**71.13%**	69
Total		97

Results

- More repeat/ rejects
- More call backs
- Increased patient anxiety
- Unnecessary radiation exposure
- Inefficiency
- OJT injuries by using techniques that are not ergonomically sound

We need

- Accurate methods for determining actual number of images taken
- Accurate method for analyzing positioning standards
- The ability to provide corrective action plans for improving positioning errors
- Current data (last published in 1993 that was done with FS units)
- The establishment of standardized positioning techniques

Do standardized positioning techniques work?

- Used consistently for 40+ years in Sweden
- Was taught by ACR in the 1990s with no update since then
- Results published by Bassett et al
- Current preliminary data regarding standardized positioning techniques is impressive

Mammographic Positioning: Evaluation from the Viewbox*

- Following standardized training overall improvement was seen in 68% of all mammographic exams.
- “Ideal” criteria only met 64% of the time due to variable patient body habitus etc.

*Bassett, LW et al: Radiology 1993; 188:803-806

STANDARDIZED TRAINING

Northwestern University 2012

- After standardized training showed a **50%** reduction in Technical Call Backs (positioning, blur, etc.)

* No published study

Metropolitan Chicago Breast Cancer Task Force

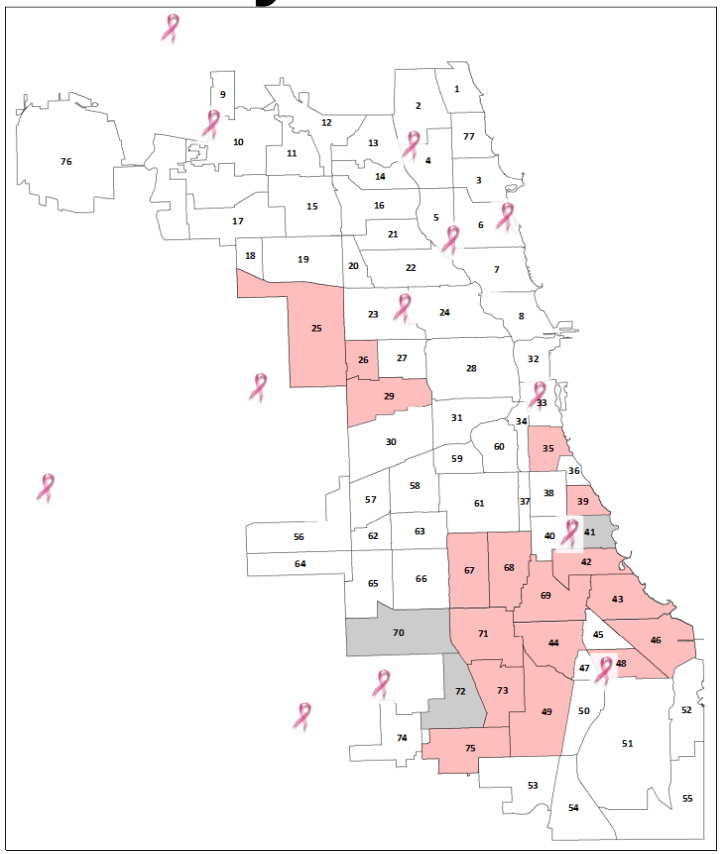
MAMMOGRAPHY EDUCATORS

Chicago Community Areas with the Highest 2006-2010 Average Annual Breast Cancer Mortality Rates

High mortality Predominantly African American Community Areas

High mortality Non-African American Community Areas

American College of Radiologists Breast Imaging Centers of Excellence



Data Source: Illinois Department of Public Health Vital Statistics.

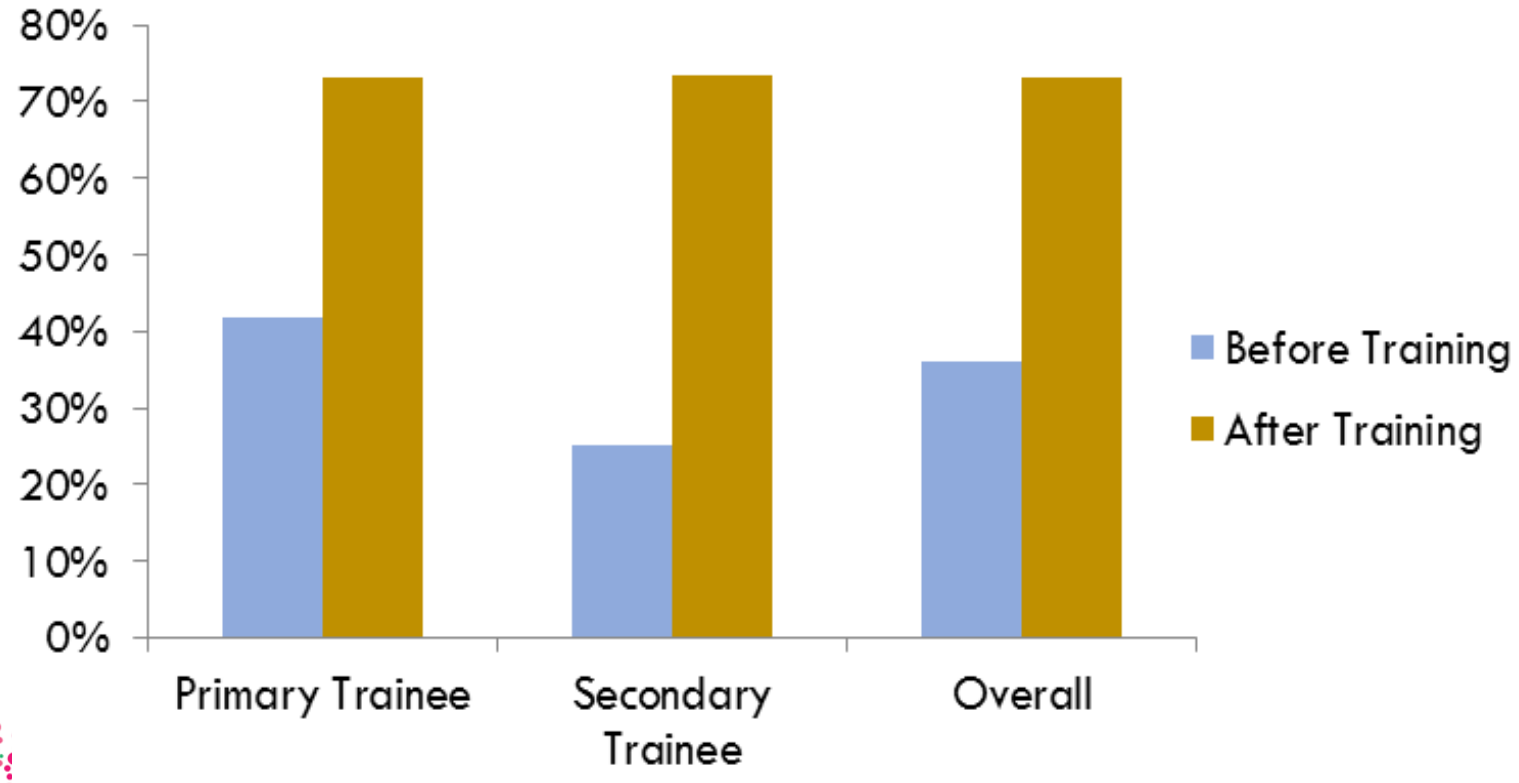
MAMMOGRAPHY EDUCATORS

What They Did to Affect Change:

- Developed a Train the Trainer certification program.
- Area technologists applied to participant in the program and chosen by specific criteria.
- They received specialized training so that they can provide effective and proven positioning techniques to other technologists in underserved areas
- Train the Trainer program used successfully for 4 years.
- Plans for expansion to other major urban areas in US

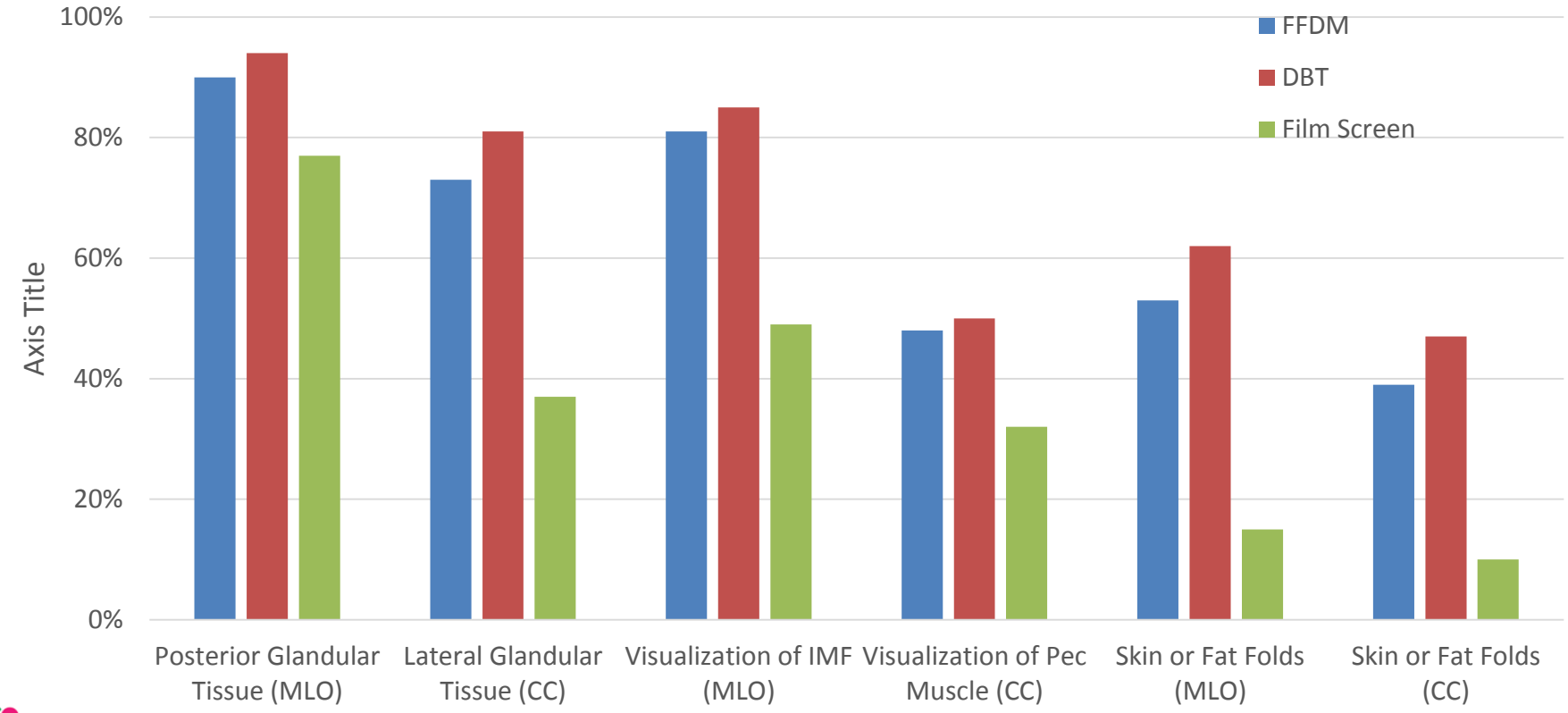
*Program designed and presented by Louise C. Miller, RTRM

Does TTT program help improve the quality of images taken by participating mammography technologists?



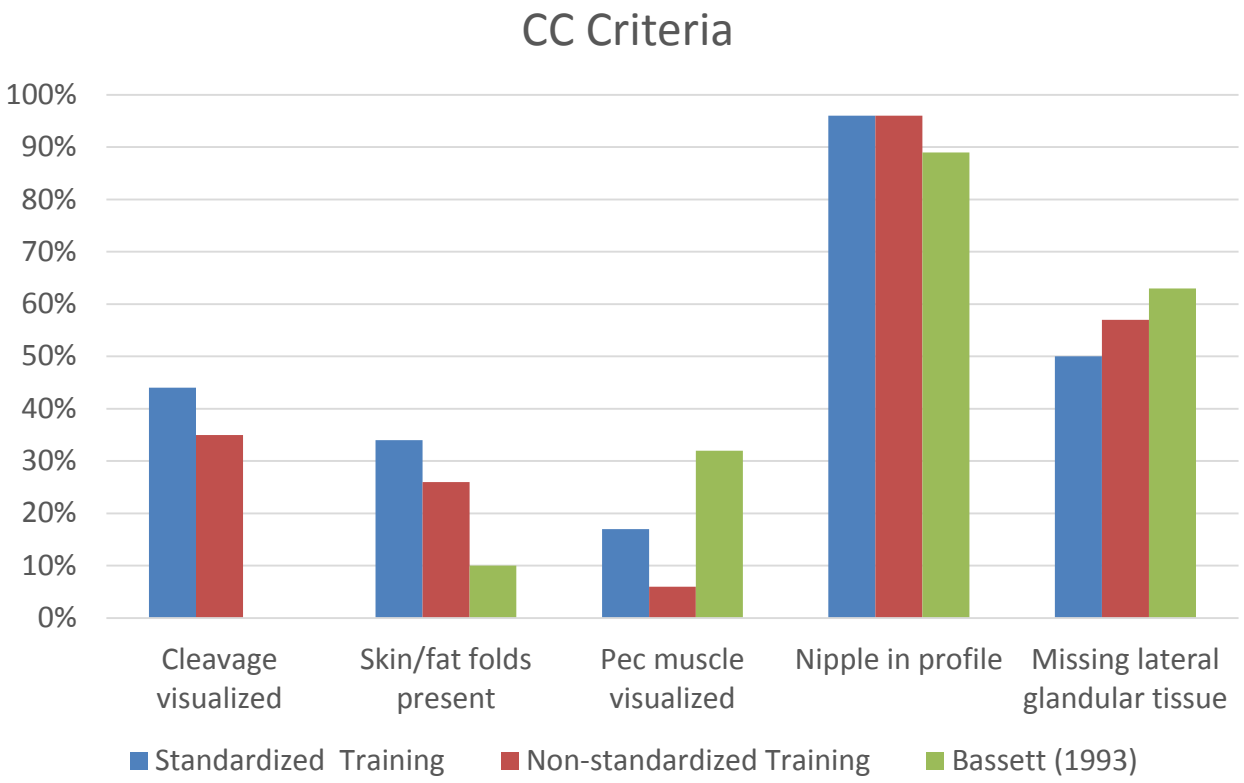
Other Data

Criteria met after Standardized Training*



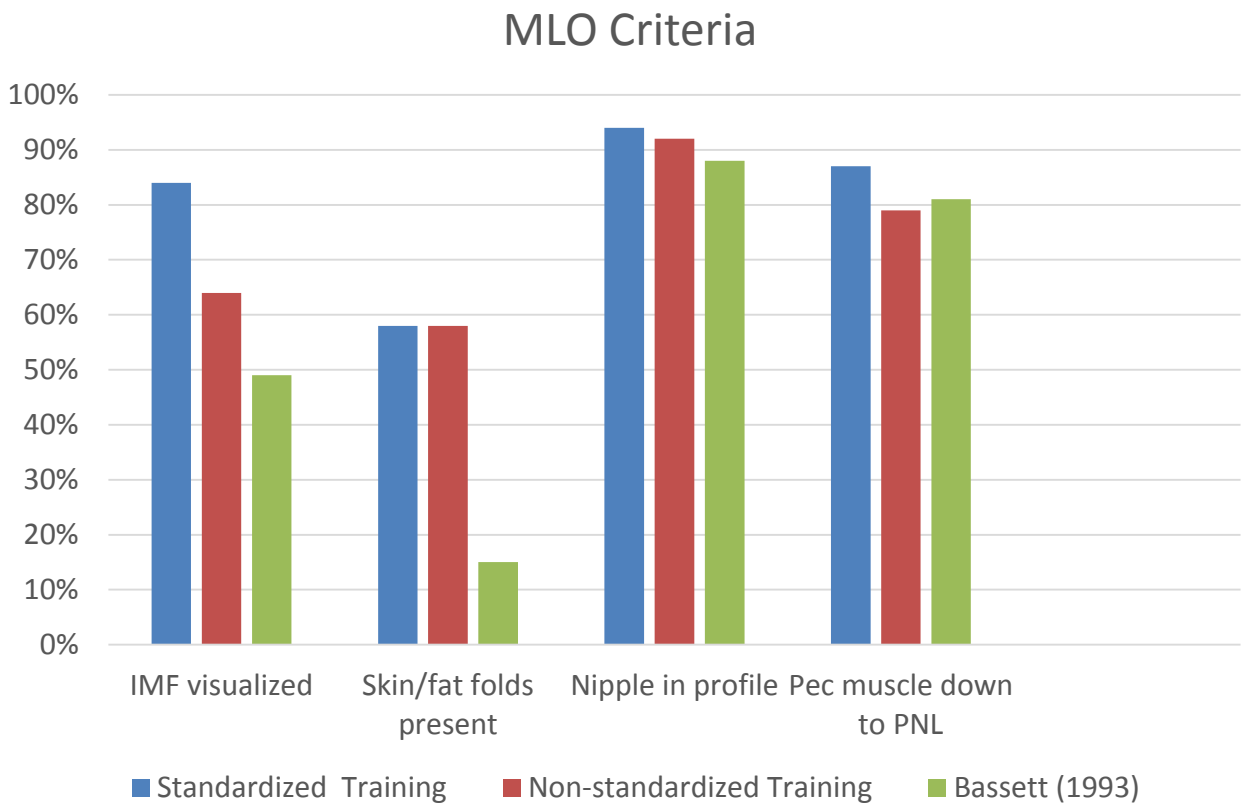
*Pending publication by a major University based Breast Imaging Department

Standardized training vs non-standardized positioning



*Pending publication by a major University based Breast Imaging Department

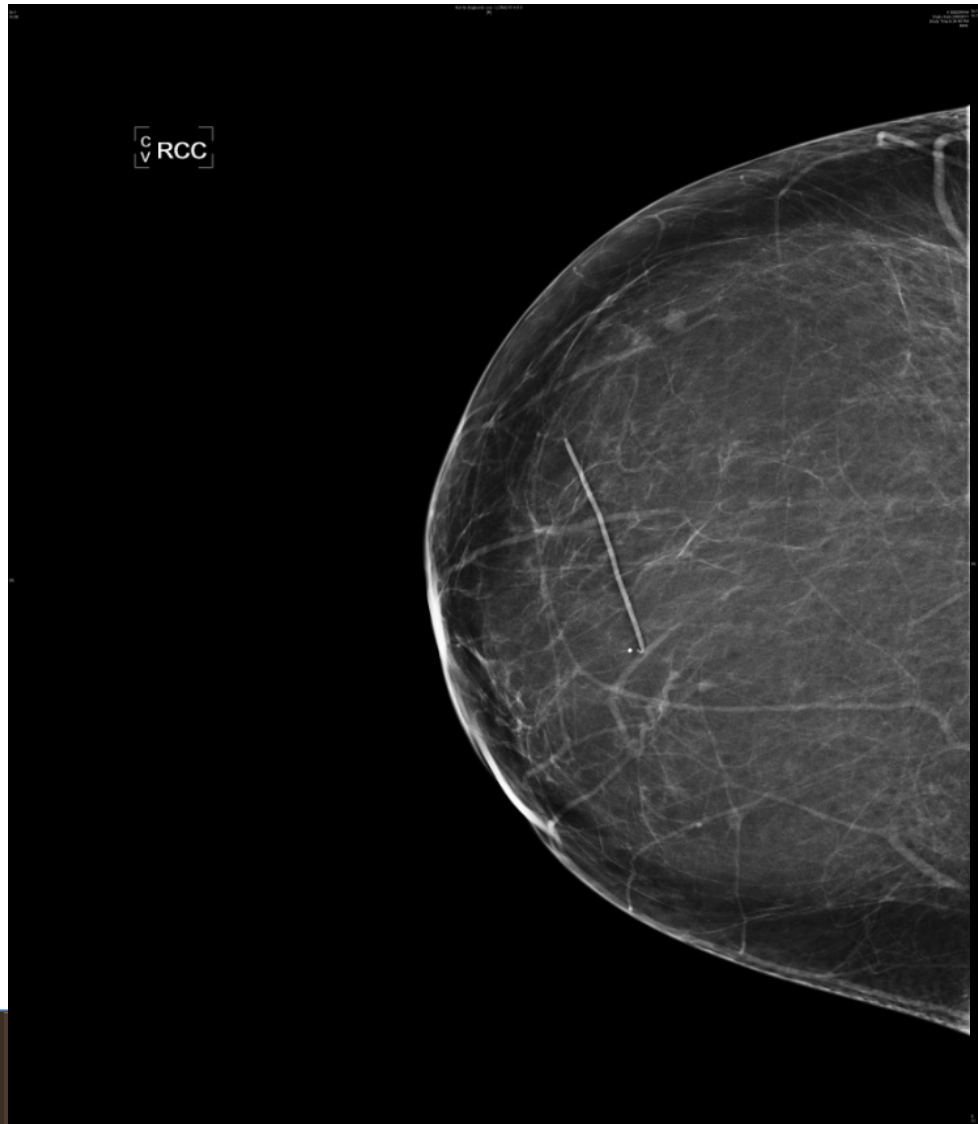
Standardized training vs non-standardized positioning

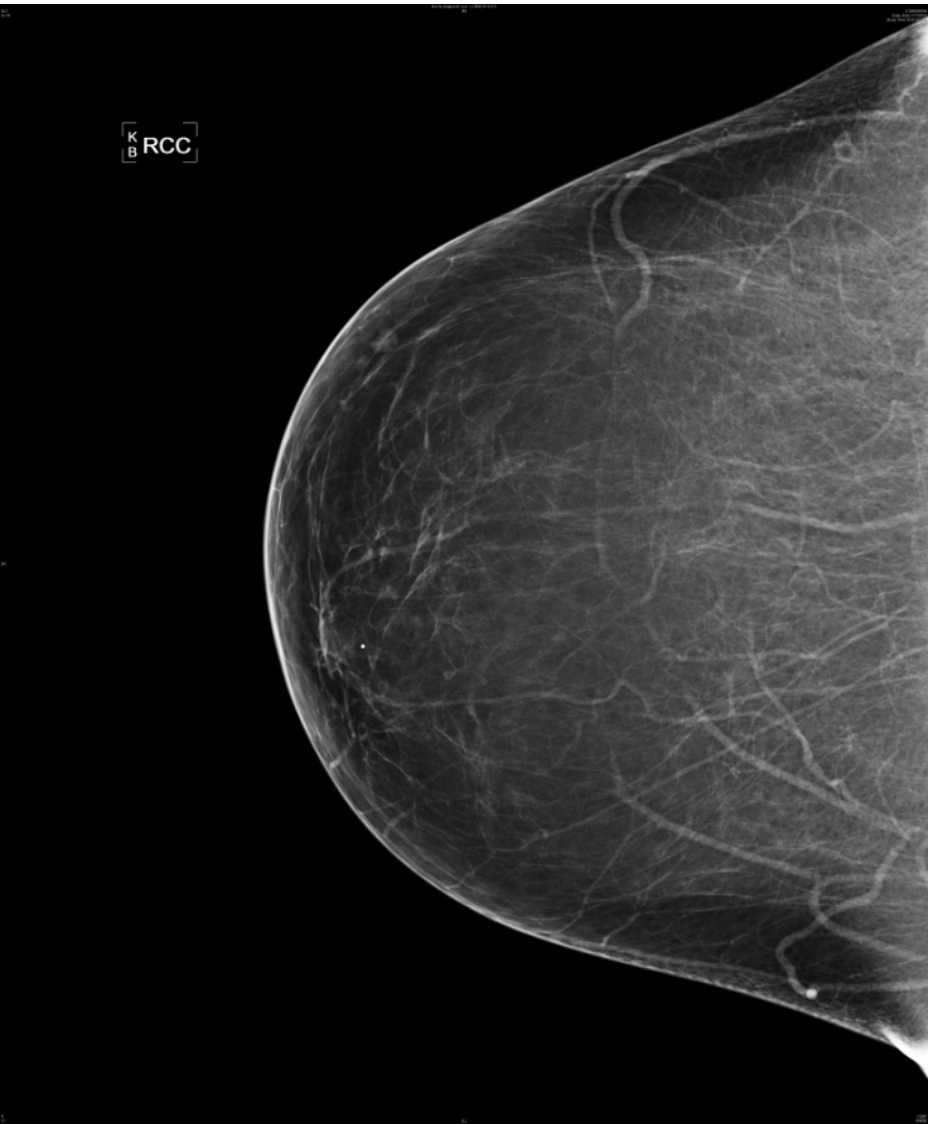


* Pending publication by a major University based Breast Imaging Department

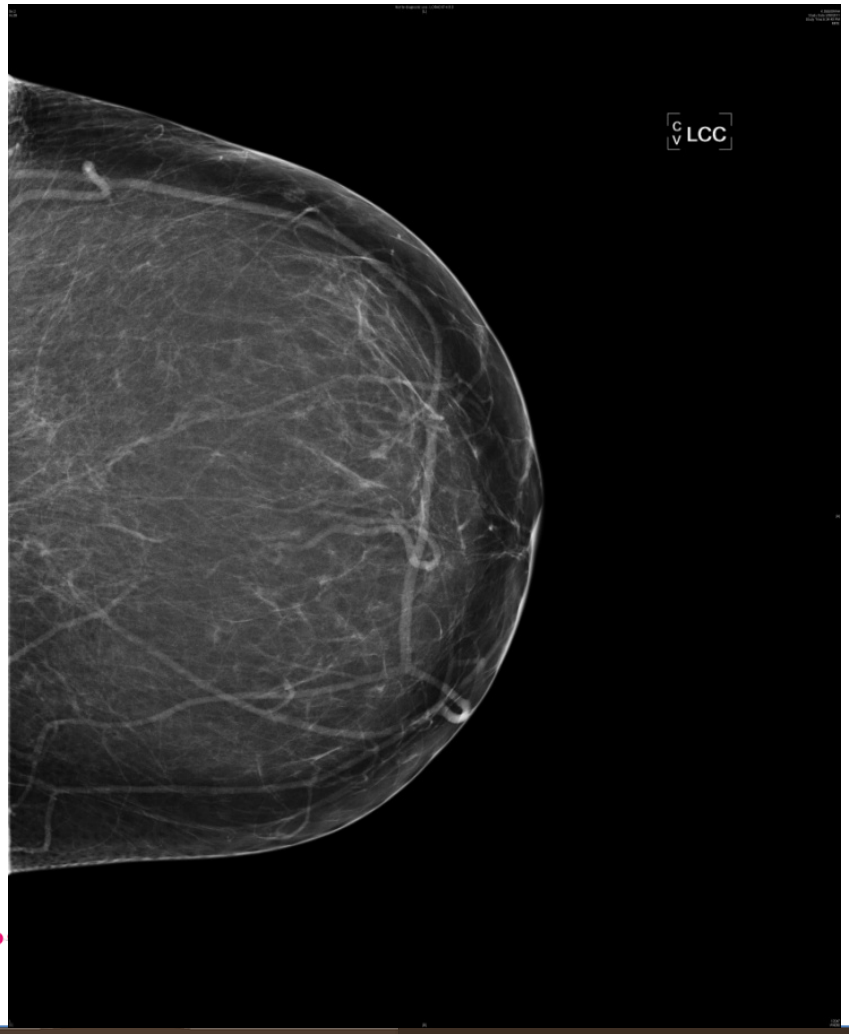
BEFORE **STANDARIZED POSITIONING** **AFTER**

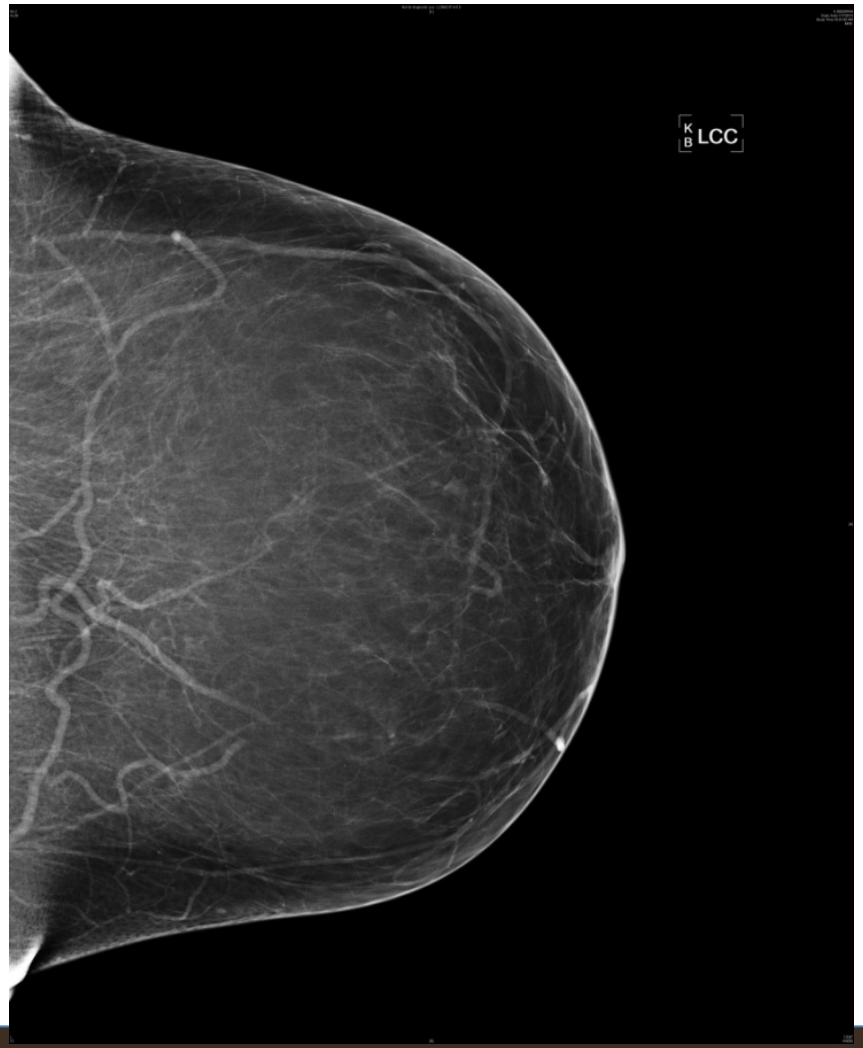
13.1 cm **+3.0 cm** **16.6 cm**





BEFORE	STANDARDIZED POSITIONG	AFTER
14.8 cm	+2.0 cm	16.8 cm





BEFORE STANDARDIZED POSITIONING AFTER

17.1 cm +1 cm 18.1 cm

BEFORE STANDARDIZED POSITIONING AFTER

11.8 cm +1.0 cm 12.8 cm

BEFORE **STANDARDIZED POSITIONING** **AFTER**

13.9 **+1.3 cm** **14.6 cm**

Other Considerations

- No current data on motion or related call backs
- Method for recording repeat/rejects does not accurately represent number of images taken

Repeat/Reject Rates

- Technologists select from categories to justify additional images taken for poor positioning
- Most commonly they select “patient body habitus” which will not count against their repeat/reject rate

So Who's Minding the Store?

- FDA/MQSA
- ACR
- SBI
- Lead Radiologist
- The Breast Imaging Manager
- The Lead Tech
- The Mammography Technologist

It is ALL our responsibility to make sure that ALL women receive the highest quality of mammogram achievable